TECHNICAL FIELD

Financial methods, processes, logic, algorithms, computerized apparatus and system.

BACKGROUND

The invention is necessitated by the shortcomings evident in prior art financial theories, methodologies, practices and products. The present invention affords improvements.

Prior art financial valuation rests on a pricing relation between coupon, yield to maturity and time to maturity, wherein the price is equal to a valuation formula based on a summation. This summation form creates a problem in derivation, as the first derivative, which should capture the change in price with respect to the yield, is actually only a first order term of the Taylor series approximation needed to find such a solution. Thus, the second derivative, which should capture the change in the change in price with respect to yield, is actually the second order term of the Taylor series approximation. Only by an infinite number of ordered terms does the solution become precise. The first derivative, duration, in the prior art, the first order term, is positive in magnitude, and hence fails to capture the negative magnitude of Einstein's fourth dimension, duration. Further, the prior art duration formulation contains four variables: coupon, yield, maturity and price, wherein price and yield are related by definition, and hence, the prior art formulation involves an analytic tautology, as price is defined as related to coupon, yield and maturity. Thus, prior art fails to deliver a precise algorithm for duration or to reflect space-time science. The present invention identifies a non-summation form and therefrom derives a precise first (and second) derivative.

When applied to valuation, and valuation changes over time, the prior art process is demonstrably imprecise, which often leads to tragic error when relied upon, as it is, in the

hedging of securities and portfolios. And because the nature of imprecision can over or understate the actual change in pricing, when implemented within a portfolio comprising many securities, the error of each can become diffuse in the group and can lead to calamity.

The invention provides innovative algorithms for valuing financial securities, wherein the price (P) of a security relates to three variables via a function, said securities include the group of fixed-income, equity and premium policy instruments, said variables comprising the cash receipts (C), yield (Y) and time (T) to maturity or expiration, said function relating change in price with respect to yield, at instantaneous condition, by a novel formulation of duration. The invention's duration is a perfect form first derivative based on a non-summation formulation of price respective C, Y and T, and hence, is an exact conveyance of change in price with respect to Y in continuous time. The invention's duration is isomorphic to Einstein's postulation of the fourth dimension respective three dimensions of the space-time continuum, also called duration, which he shows as bearing negative magnitude. The invention's formulation of three variables, C, Y, T, embodies the characteristics of any financial security, and has continuous relation via a fourth dimension, duration, termed K.

In discrete time, the notion of theta, the derivative with respect to increments in time, is described and is implemented in valuation mechanics and in drawings and spreadsheets. The processes accurately and precisely capture price change respective to time and yield.

The invention presents its governing yield which is the spot yield of a security or payment at present or future time. This notion can replace prior art forward rate curve process, this latter process bearing two serious flaws: 1) it is not a continuous curve, but a series of short hyperbole strung together and joined where each asymptotically explodes; 2) the prior art forward rate curve is not isomorphic to or indicative of pricing realized forward.

The invention relates portfolio aggregation methodologies which afford the establishment of valuation and sensitivity values for a portfolio as a whole, useful in trading and hedging. A variable is specified, Yield M, useful for a portfolio of one or more securities.

The invention specifies algorithms, processes and systems which provide the computation of the novel financial methods. In addition, it specifies arbitrage based thereon, as well as a fixed-income mutual fund utilizing the relative value arbitrage afforded thereby.

The assortment of available financial instruments is limited, and often, what is available, with respect to a sought after duration (for instance, for immunization of a portfolio) may not be available in the market. To such ends, and as means for creating securities which may be alternatives or arbitrage matches for existing securities, the invention creates a new class of financial security, called a Replicated Equivalent Primary Security.

Most of the valuation methods and algorithms used in the pricing of options and derivatives rely on a set of assumptions regarding the log normal condition of the underlying variables. The invention provides data cleaning techniques to identity and to test for such log normal states of a variable, which are necessary as the conditions of the underlying change. The invention provides data analysis methods and process for small sample environments.

The data cleaning technology is applied to financial variables found in depository banking and P&C insurance industries. Such variables, having nominal value, can function as the underlying variables of financial securities modeled thereon, and therefore, the invention organizes and describes the technology pertaining to underlying state, theta, variables. The invention further specifies a process useful in establishing the likelihood of default of insured depository banks. As the insured banks pay a fee to the FDIC Bank Insurance Fund, such process, utilizing a set of operating ratios in concert, can be helpful in identifying the causes

of default risk, as well as assessing the level of risk on an aggregate or individual bank basis. Included in modeling a theta variable is described its mathematical programming functions.

Pursuant to the mechanics of prior art OAS (Option Adjusted Spread) and martingale valuation lattice, useful for modeling values having an element of default or loss probability, is the shortcoming that default or loss is held realized at the event of default (or catastrophe) whereas default is followed by recovery, and a catastrophic event by loss development. Hence, the invention specifies a modified lattice incorporating the recovery and development.

Given that the insured depository banks pay insurance fees to the FDIC's BIF, and given that the Property & Casualty insurance industry has a shortage of underwriting capacity with respect to the prospect of severe catastrophic losses, and because the taxpaying public stands as the end guarantor against catastrophic bank depository default and catastrophic loss, presented herein is a swap transaction between the quasi-governmental bodies of the FDIC and the NAIC, between insured depository default and catastrophic loss, useful on industry treaty or per individual institution basis. Specified therein is the use of public sector capital. Such swap or treaty reinsurance provides a mechanism towards open market reinsurance of such relatively uncorrelated risks between the insured banking and P&C insurance industries.

Among the aspects of the invention are specifications of computerized apparatuses and systems to performing valuation, analysis, identification and execution of transactions. Further aspects of the invention include improvements to the art of computational calculators. Such improvements include resident educational features for teaching and scholastic usage. Specified in functional detail is a financial engineering calculator, with computational and resident coded features suitable to the demanding needs of the technical financial community.

To date, the prior art financial calculators provide only few rudimentary resident algorithms and lack resident reference resource type items, these shortcomings directly addressed herein.

SUMMARY

Methods and processes for valuing a financial security, wherein comprising unique mathematical and computational programming functions. A method for portfolio aggregation. Processes computing change in price of a security or portfolio respective a change in yield. These methods and processes are demonstrated as more robust and precise than standard art. A security composed of similar securities, engineered in manufacture process to reflect target criterion. These securities would afford investors customized hedging or immunization needs. Business logic of analytic valuation, of security generation, and of arbitrage differentials and relative value spreads, such providing basis of computerized automation. A computer-based system which incorporates the business logic engines. A mutual fund, operating on the methods, processes, business logic and system, for investor public. Numerical data cleaning and preparation. Further process utilizing cleaned and prepared data. A process establishing a likelihood of default of depository banks by use of operating ratios. Method and process simulating variable statistical distributions in small sample environment. A theta variable modeling technology, including a process of theta's mathematical programming functions. An OAS/martingale valuation lattice, modified for default or loss and recovery or development. A business process, a swap transaction, between insured deposit default and catastrophic loss. Improvements to the art, and unique functional specifications, of computational calculators.